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(54) **LIFT SYSTEM FOR A PATIENT-SUPPORT APPARATUS**

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(51) **Int. Cl.**
A47B 7/00 (2006.01)
A47C 31/00 (2006.01)

(52) **U.S. Cl.** **5/611**; 5/11

(58) **Field of Classification Search** ..... 5/611, 5/11, 509.1; 254/4 C, 47; 187/210, 213, 187/259, 261
See application file for complete search history.

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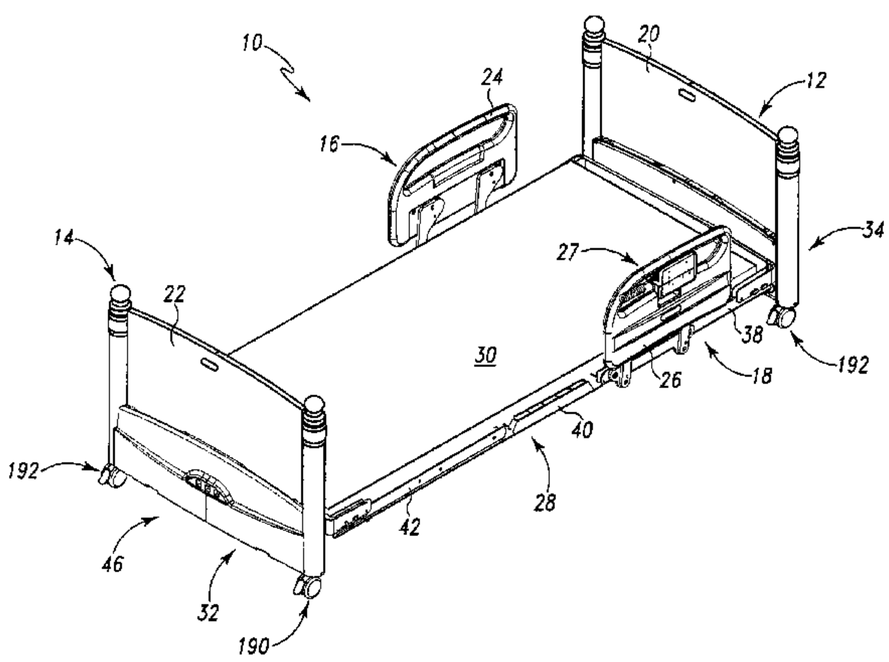
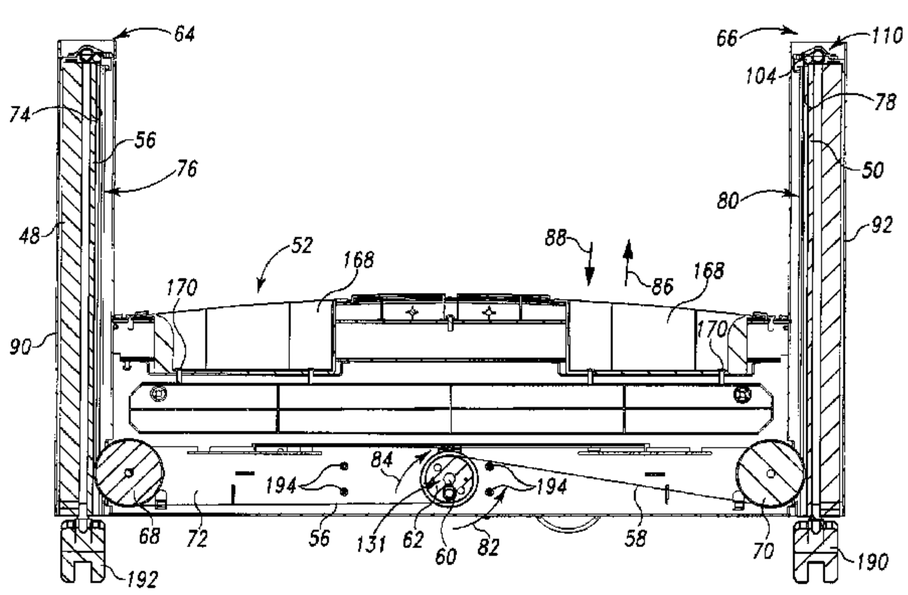
(57) **ABSTRACT**

A patient-support apparatus includes a patient-support deck coupled to first and second lift systems configured to lift the patient-support deck relative to the floor. The lift systems each include a pair of supports and a carriage coupled to the patient-support deck and suspended from the supports by tethers which are wound and unwound to raise and lower the patient-support deck.

23 Claims, 11 Drawing Sheets





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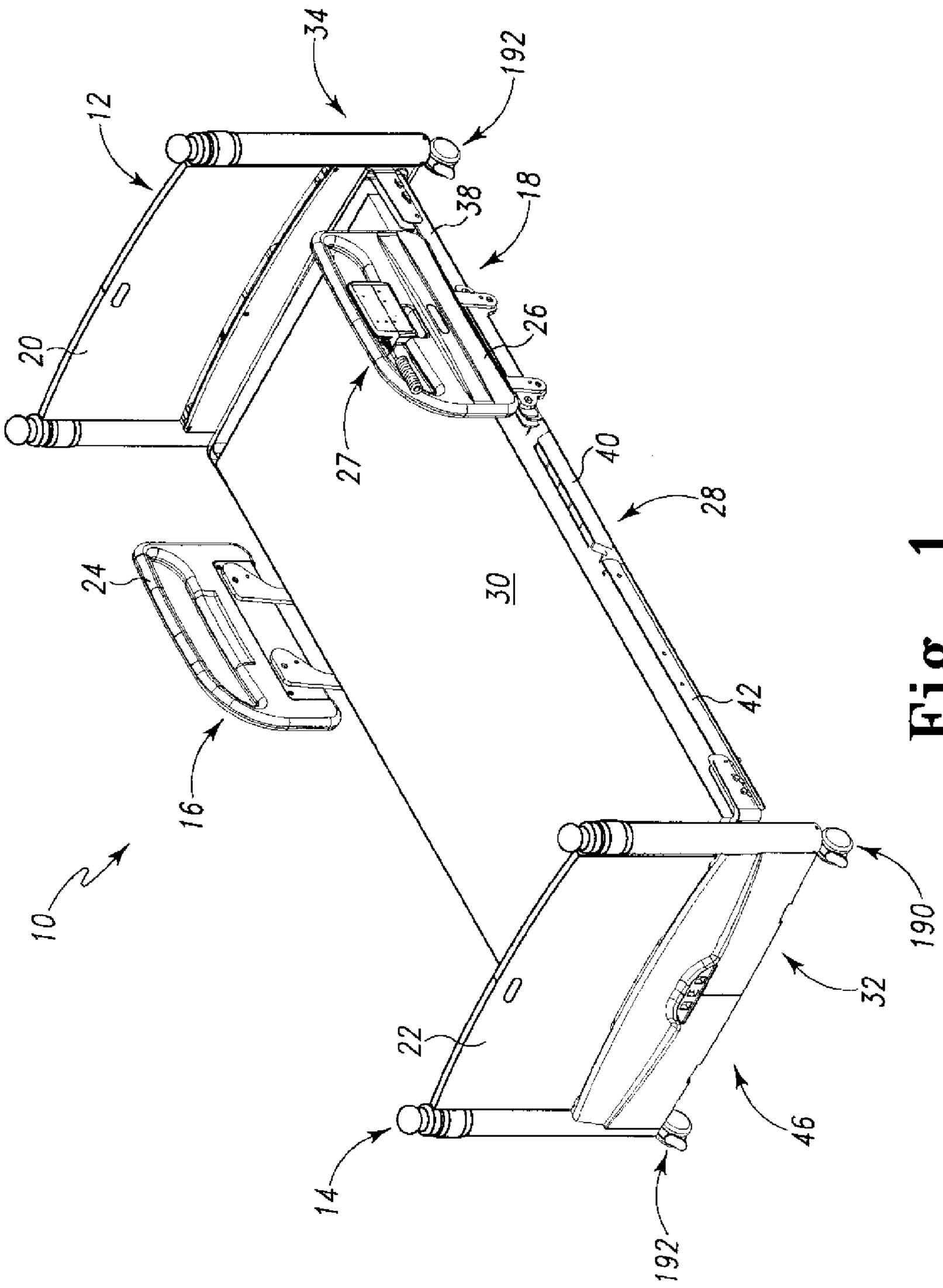


Fig. 1

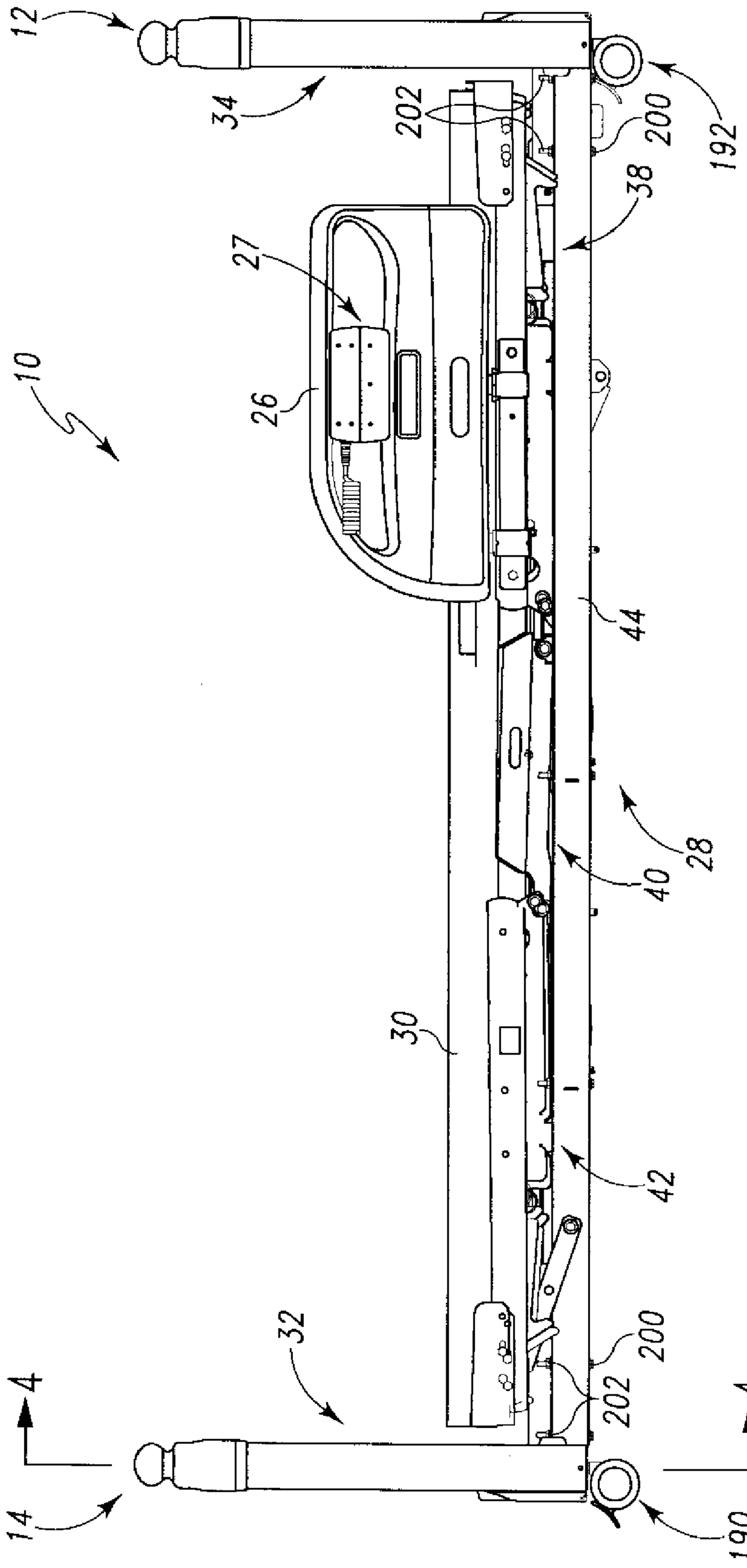
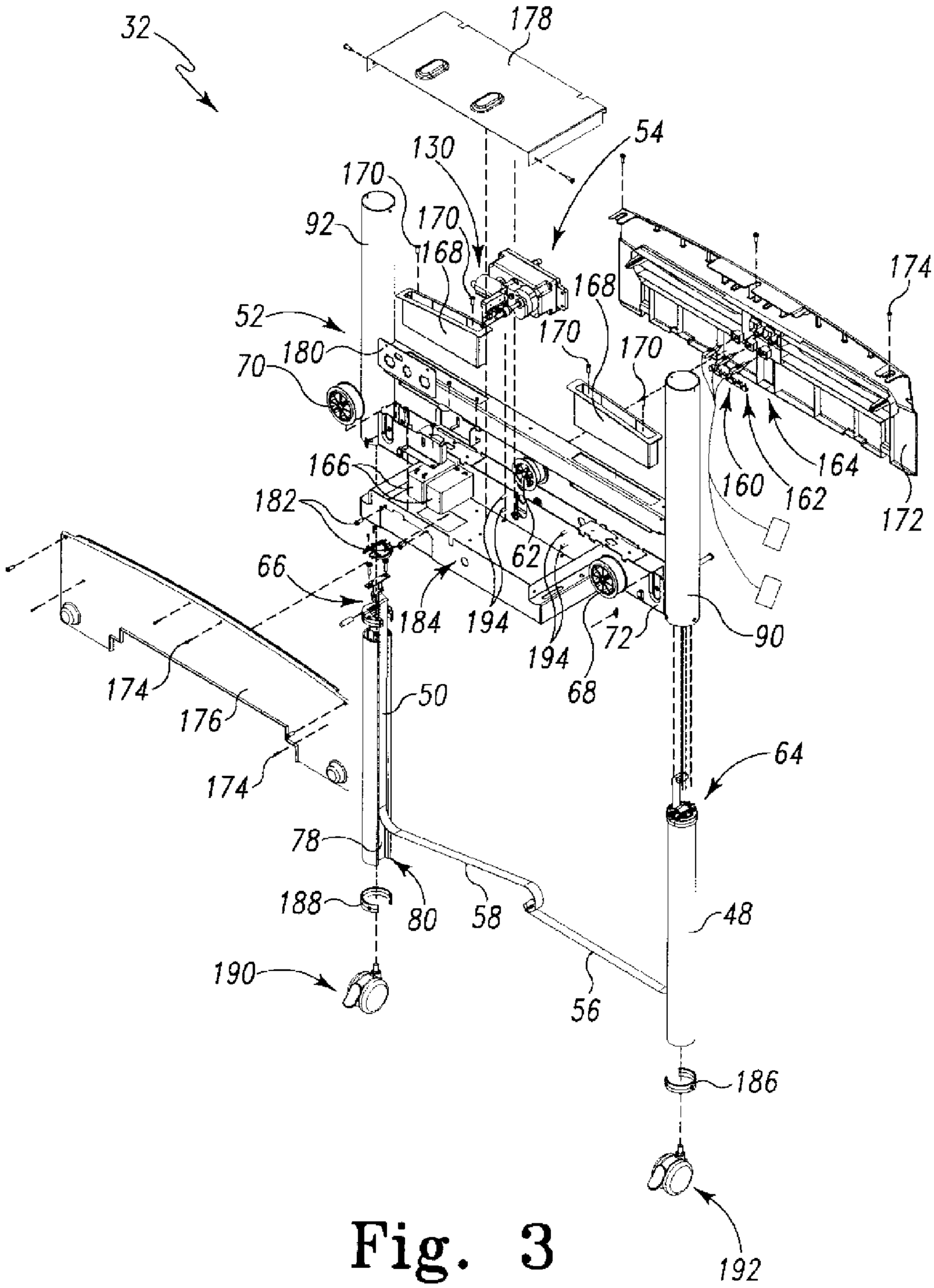


Fig. 2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170
92
170
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52
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174
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70
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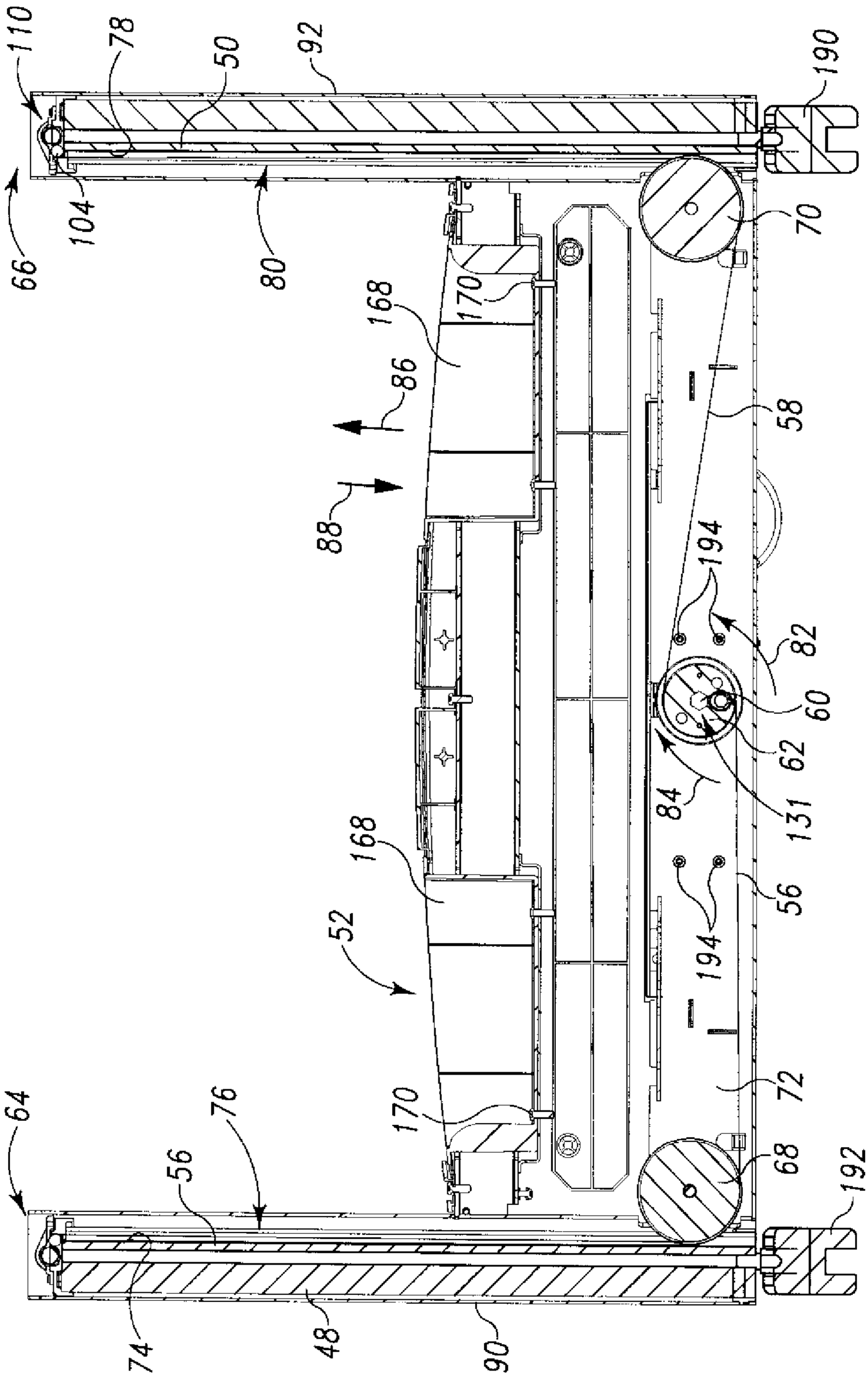
62
66
184
194
194
72
90
68
174
176
174
50
64
78
188
80
58
48
190
56
186
192

Fig. 3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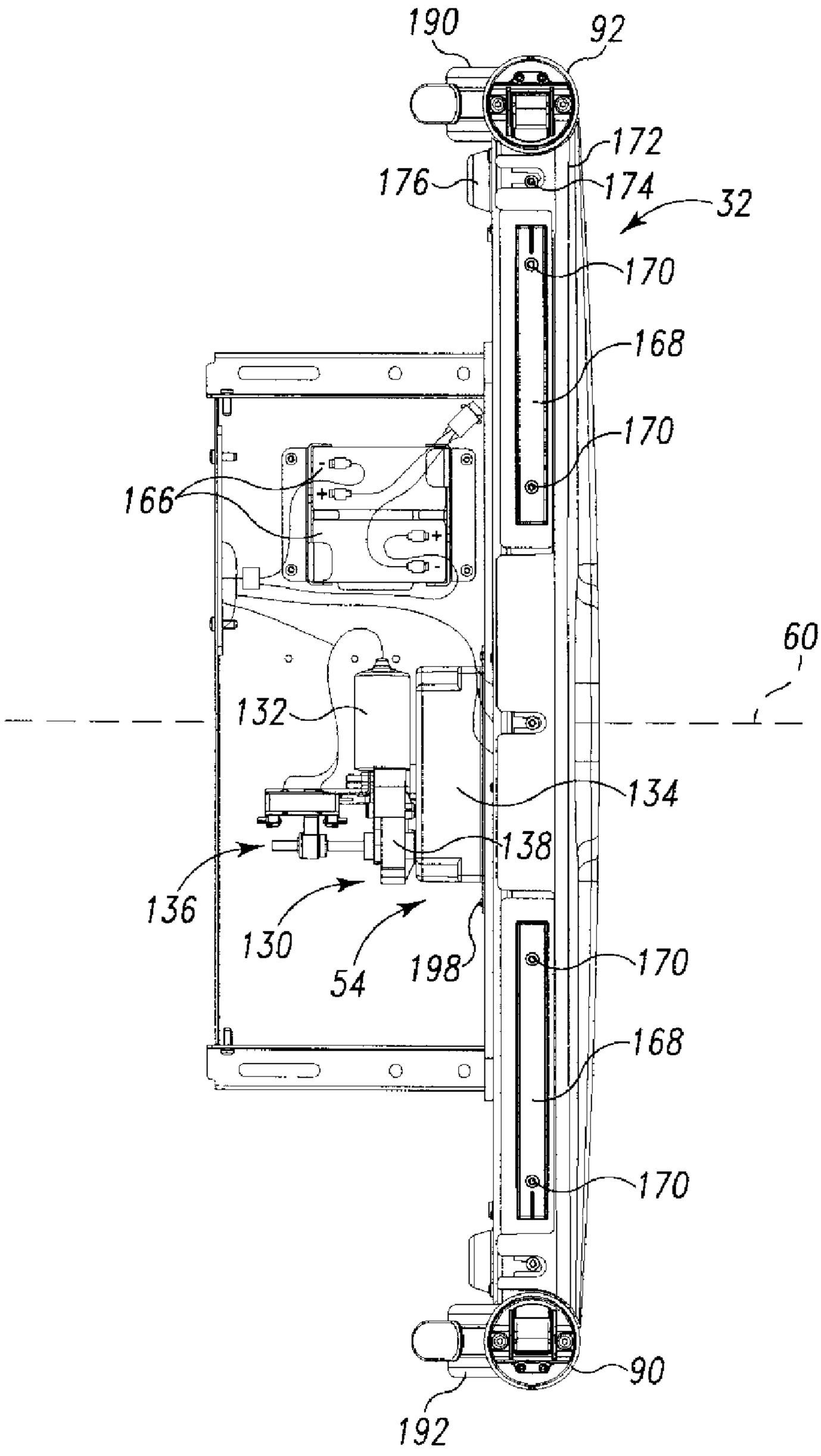
56
170
72
68
192
74
48
90

Fig. 4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92
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54
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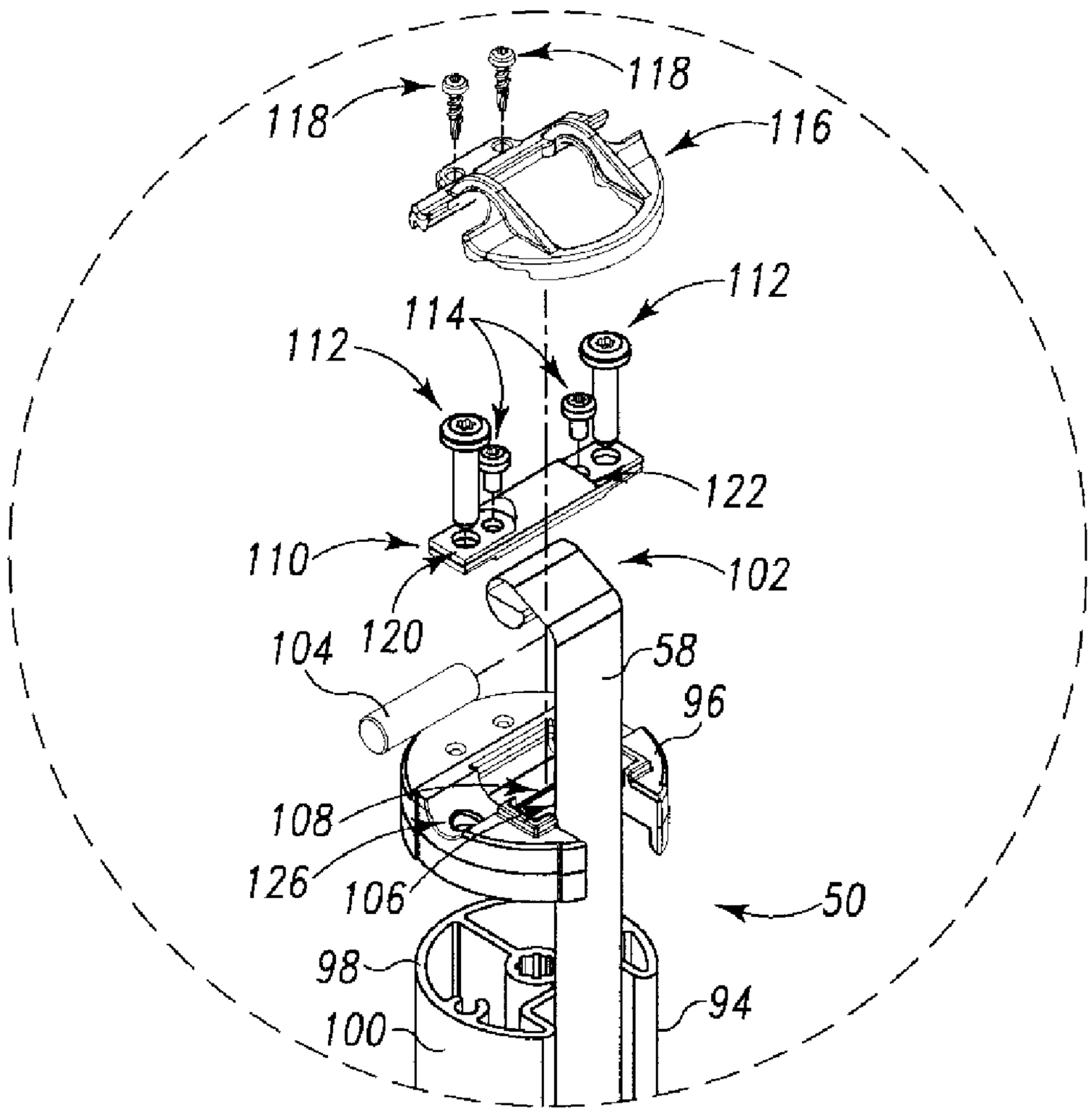
170
90
192

Fig. 5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122
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102
104
120
58
96
108
126
106
50
98
94
100

Fig. 6

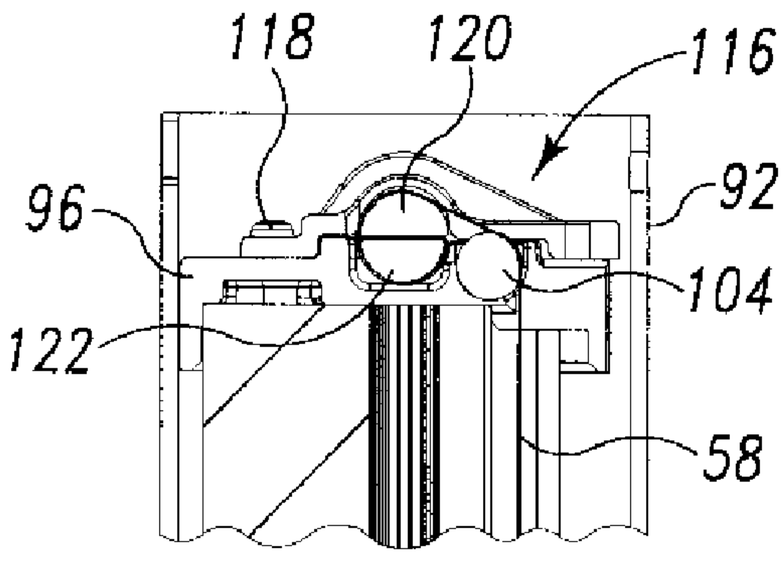
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Fig. 7

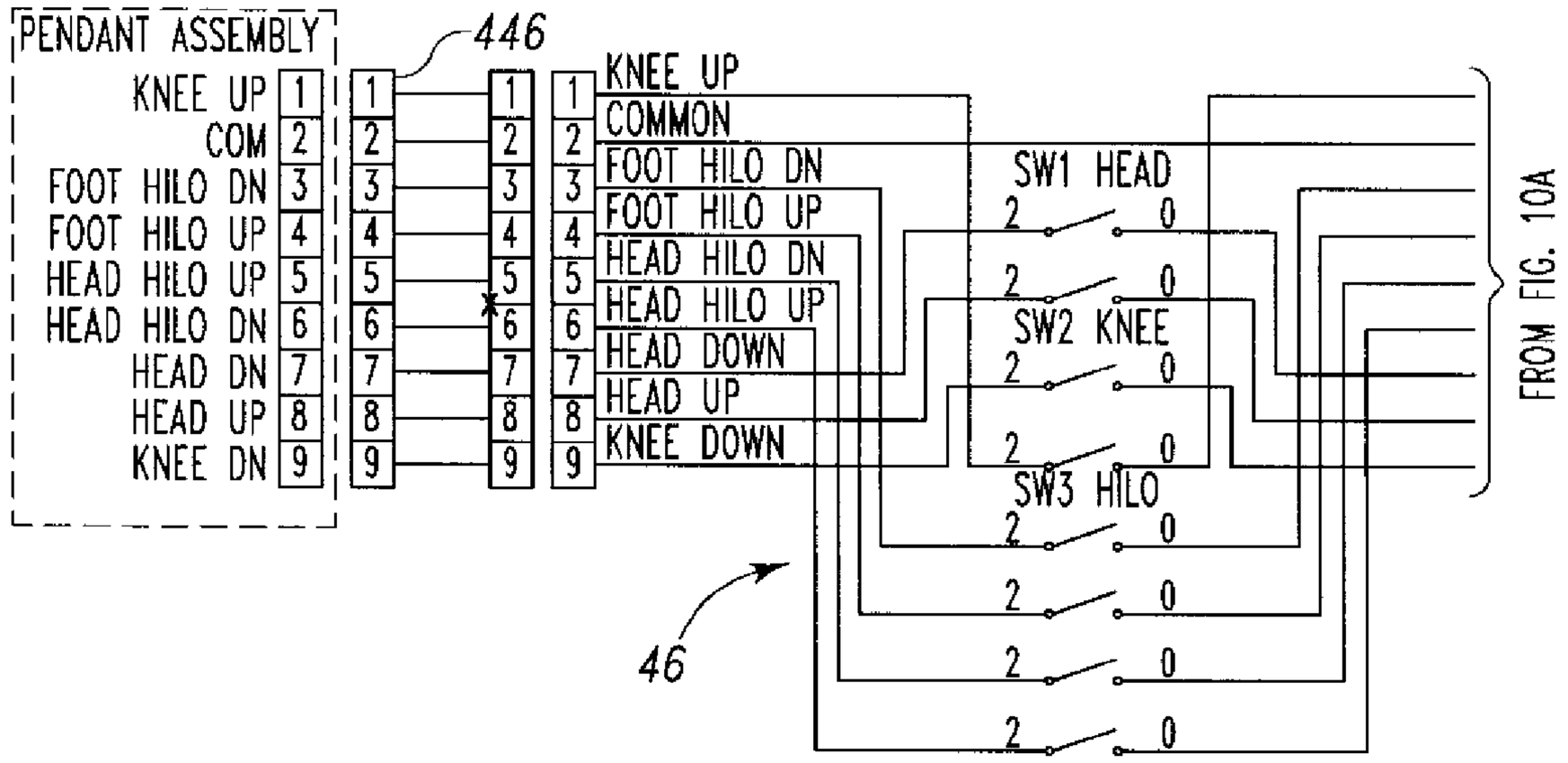

PENDANT ASSEMBLY
KNEE UP 1
COM 2
FOOT HILO DN 3
FOOT HILO UP 4
HEAD HILO UP 5
HEAD HILO DN 6
HEAD DN 7
HEAD UP 8
KNEE DN 9
446
KNEE UP
COMMON
FOOT HILO DN
FOOT HILO UP
HEAD HILO DN
HEAD HILO UP
HEAD DOWN
HEAD UP
KNEE DOWN
SW1 HEAD
SW2 KNEE
SW3 HILO
2
0
FROM FIG. 10A
46

Fig. 8A

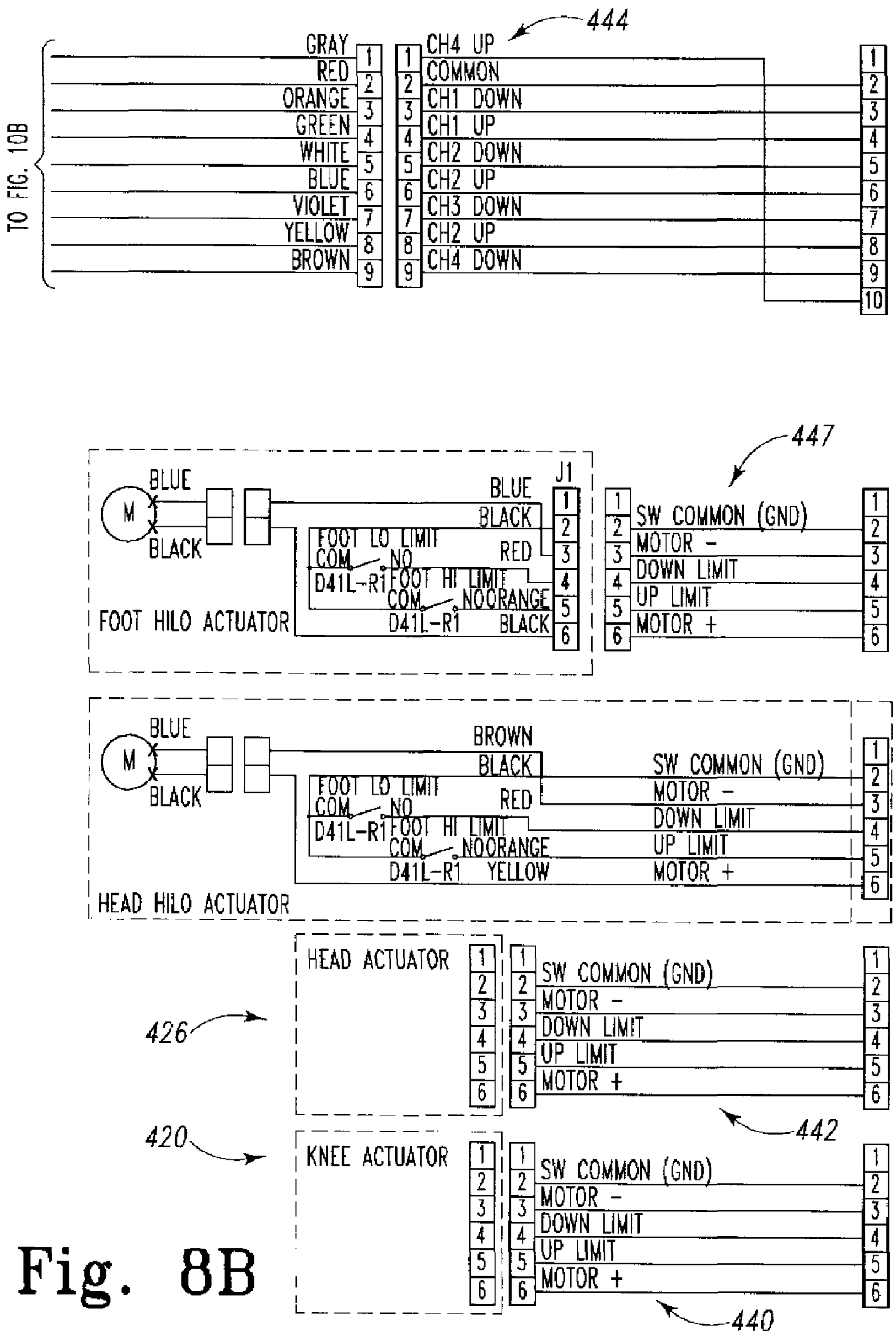
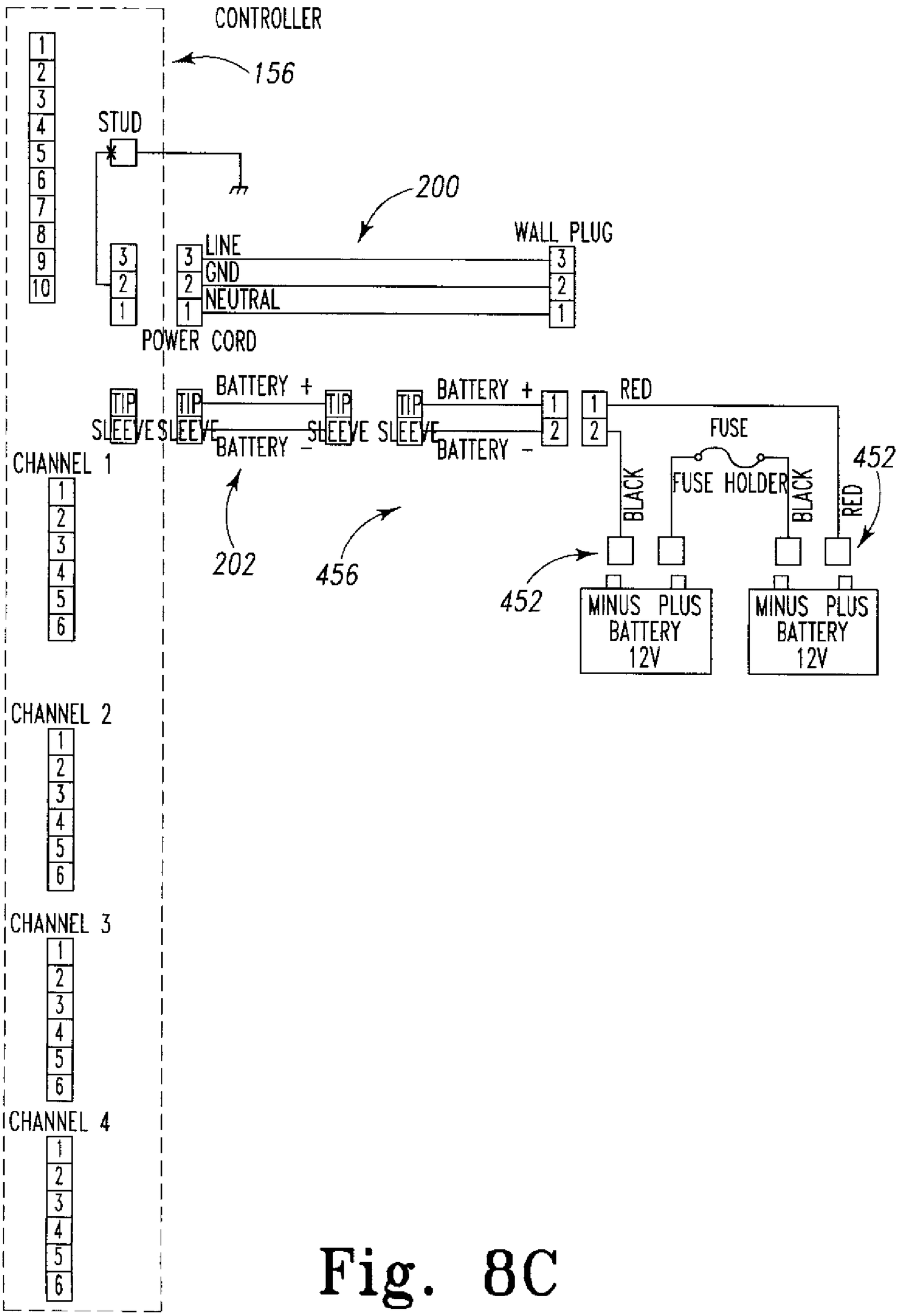

444
TO FIG. 10B
GRAY
RED
ORANGE
GREEN
WHITE
BLUE
VIOLET
YELLOW
BROWN
CH4 UP
COMMON
CH1 DOWN
CH1 UP
CH2 DOWN
CH2 UP
CH3 DOWN
CH2 UP
CH4 DOWN
447
BLUE
BLACK
FOOT HILO ACTUATOR
FOOT LO LIMIT
COM
NO
D41L-R1
FOOT HI LIMIT
COM
NO
ORANGE
D41L-R1
BLACK
J1
SW COMMON (GND)
MOTOR -
DOWN LIMIT
UP LIMIT
MOTOR +
BROWN
BLACK
RED
YELLOW
HEAD HILO ACTUATOR
426
HEAD ACTUATOR
420
KNEE ACTUATOR
442
440

Fig. 8B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STUD
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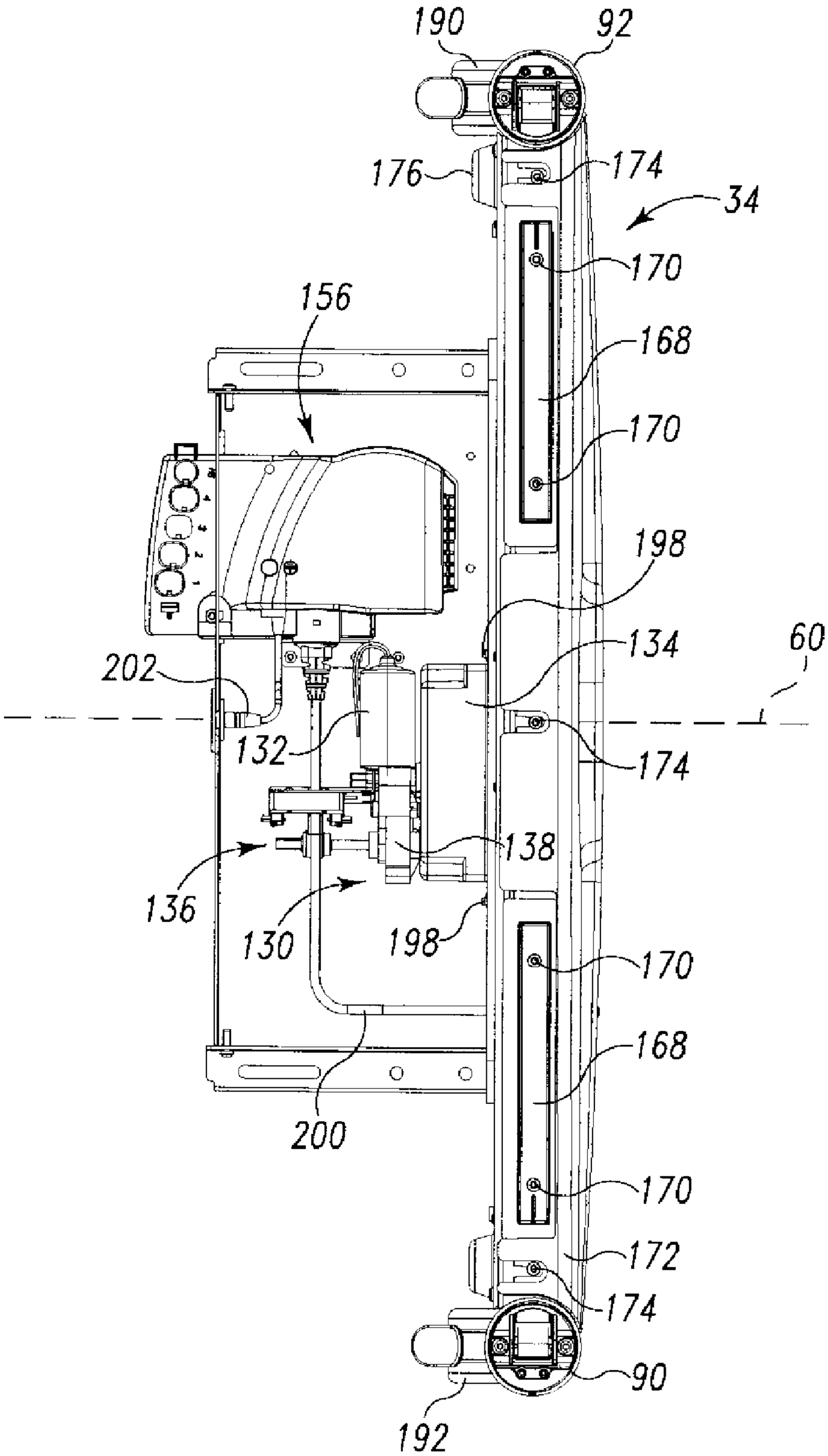
WALL PLUG
LINE
GND
NEUTRAL
POWER CORD
TIP
SLEEVE
BATTERY +
BATTERY -
202
456
452
RED
FUSE
FUSE HOLDER
BLACK
BLACK
RED
MINUS PLUS
BATTERY
12V
MINUS PLUS
BATTERY
12V
CHANNEL 1
CHANNEL 2
CHANNEL 3
CHANNEL 4

Fig. 8C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90
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Fig. 9

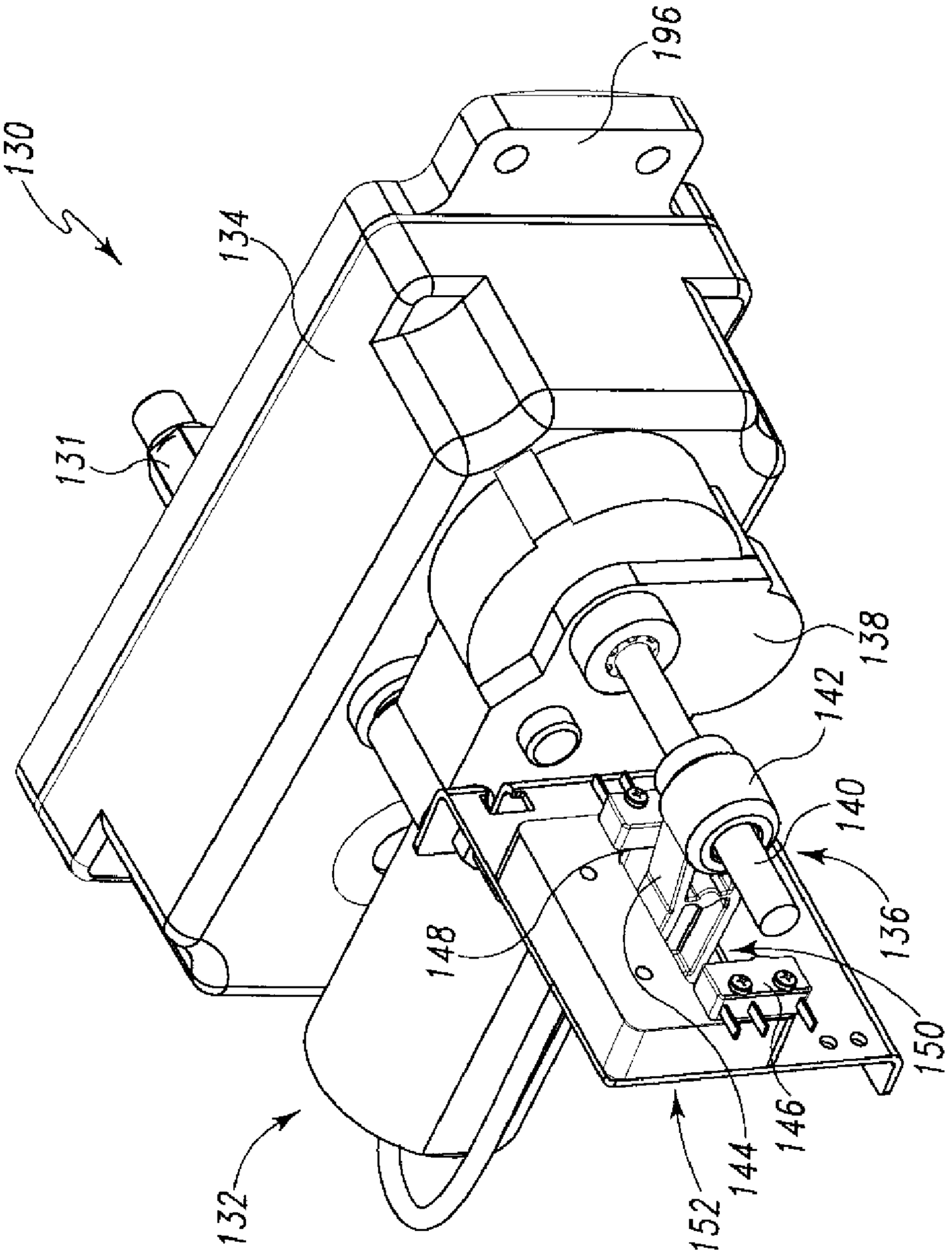

Fig. 10

LIFT SYSTEM FOR A PATIENT-SUPPORT APPARATUS

This application claims priority under 35 U.S.C. § 119(e) to U.S. Provisional Patent Application Nos. 60/871,017, filed Dec. 20, 2006, 60/884,793, filed Jan. 12, 2007, and 60/956,805, filed Aug. 20, 2007, each of which is hereby incorporated by reference herein.

BACKGROUND OF THE INVENTION

The present disclosure is related to patient-support apparatuses having lift systems.

Patient-support apparatuses such as a hospital beds, for example, are known to use linear actuators which extend and retract to move portions of the apparatus relative to other portions. Movement of one portion of the patient support apparatus relative to another portion results in raising patient-support deck sections of the apparatus relative to some support frame, or lifting an entire patient-support deck relative to other members of the patient-support apparatus. Lift motors are known to be positioned beneath the patient-support deck and occupy a space between the patient-support deck and the floor.

SUMMARY OF THE INVENTION

The present disclosure comprises one or more of the features recited in the appended claims and/or the following features which, alone or in any combination, may comprise patentable subject matter:

According to the present disclosure, a patient-support apparatus includes a plurality of supports, a tether coupled to a support, a patient-support platform, and winding means for winding and unwinding the tether to vary the height of the patient-support platform. The winding means may be secured to the patient-support platform. The patient-support platform may include a frame and a plurality of deck sections pivotable relative frame. The patient-support platform may further include a plurality of actuators with each actuator coupled to a deck section and operable to move the deck section relative to the frame.

The winding means may include a spool and a prime mover coupled to the spool and configured to rotate the spool to wind and unwind the tether. The prime mover may include an electric motor. The prime mover may further include a limit assembly driven by the output of the motor, the limit assembly configured to limit operation of the motor when the patient-support platform reaches a vertical limit. The prime mover may further include a speed reducer interposed between the motor and the spool The tether may include a stainless steel band.

Also according to the present disclosure, a lift system for a patient-support apparatus may include a tether configured to be coupled to a first portion of the patient-support apparatus, and a winder coupled to the tether distal to the first portion. The winder may be configured to be coupled to a second portion of the patient-support apparatus and to rotate relative to the second portion of the patient-support apparatus. The winder may be further configured to wind the tether to vertically raise the second portion relative to the first portion and to unwind the tether to vertically lower the second portion relative to the first portion.

The winder may include a spool and a motor to drive the spool. The motor may also drive a limit assembly configured to limit the operation of the motor when the patient-support platform reaches a vertical limit. The winder may include a speed reducer interposed between the motor and the spool. The tether of the lift system may include a stainless steel strap.

Still also according to the present disclosure, a patient-support apparatus includes a patient-support platform, a plurality of columns configured to engage a floor, a tether coupled to a column, and a winder coupled to the patient-support platform. The winder is suspended by the tether and configured to gather the tether and release a tether to thereby raise and lower the patient-support platform relative to the floor.

The winder may be driven by a motor. The patient-support platform may include a frame and a plurality of deck sections pivotable relative to the frame. The winder may include a spool, a motor to drive the spool. The output of the motor may also drive a limit assembly configured to limit the operation of the motor when the patient-support platform reaches a vertical limit.

The tether may include a first tether portion coupled to a first column and a second tether portion coupled to a second column. When two tether portions are present, the tether portions are contemporaneously gathered and released by the winder such that the patient-support platform raises and lowers along each of the first and second columns at generally the same speed. The patient-support platform may include an outer tube coupled to the frame and configured to receive a column and a spool coupled to the outer tube. The spool may be configured to engage the tether and to rotate relative to the outer tube as the tether is gathered and released by the winder such that the spool guides the tether to the winder as the winder rotates.

Yet still according to the present disclosure, a patient-support apparatus may include a first portion, a tether coupled to a first portion of the patient-support apparatus, a second portion of the patient-support apparatus movable relative to the first portion, and a winder coupled to the tether distal to the first portion. The winder may be supported on the second portion and rotatable relative to the second portion to wind and unwind the tether to thereby raise and lower the second portion of the patient-support apparatus relative to the first portion. The winder may be driven by a motor. The tether may engage a roller on the second portion. The roller may be configured to guide the tether as the winder gathers and releases the tether. The tether may include a stainless steel strap. The winder may include a spool, a motor driving the spool to rotate the spool about a horizontal axis, and a speed reducer interposed between the motor and the spool.

Additional features, which alone or in combination with any other feature(s), including those listed above and those listed in the claims, may comprise patentable subject matter and will become apparent to those skilled in the art upon consideration of the following detailed description of illustrative embodiments exemplifying the best mode of carrying out the invention as presently perceived.

BRIEF DESCRIPTION OF THE DRAWINGS

The detailed description particularly refers to the accompanying figures in which:

FIG. **1** is a perspective view of a patient-support apparatus including a pair of lift systems position near the head end and near the foot end of the patient-support apparatus;

FIG. **2** is a side view of the patient-support apparatus of FIG. **1**, the patient-support apparatus with the patient-support deck positioned at a lowest vertical position;

FIG. **3** is an exploded perspective assembly view of the lift system positioned near the foot and of the patient-support

apparatus of FIG. **1**, from the perspective of a person positioned at the patient's right side of the bed looking toward the foot end lift system;

FIG. **4** is a cross-sectional view of the lift system positioned near the foot end of the patient-support apparatus of FIG. **1**, the cross-section taken along the lines **4-4** in FIG. **2** and looking toward the head end of the patient-support apparatus;

FIG. **5** is a top view of the lift system positioned near the foot end of the patient-support apparatus shown in FIG. **1**, the lift system having portions removed;

FIG. **6** is an enlarged exploded perspective view of a portion of the lift system shown in FIG. **3**;

FIG. **7** is a cross-sectional view of the structure shown in FIG. **6**, in an assembled condition

FIG. **8**A is portion of a schematic diagram of the electrical system of the patient-support apparatus of FIG. **1**;

FIG. **8**B is portion of a schematic diagram of the electrical system of the patient-support apparatus of FIG. **1**;

FIG. **8**C is portion of a schematic diagram of the electrical system of the patient-support apparatus of FIG. **1**;

FIG. **9** is a top view of the lift system positioned near the head end of the patient-support apparatus shown in FIG. **1**, the lift system having portions removed; and

FIG. **10** is a perspective view of a prime mover shown in FIG. **8**.

DETAILED DESCRIPTION OF THE DRAWINGS

According to the present disclosure, a patient-support apparatus **10** embodied as a bed includes a patient-support platform **28** supported on two lift systems **32**, **34** and movable vertically to change the elevation of the patient-support platform **28**. Illustratively, bed **10** may be used either in a home or in an institution such as a hospital or nursing facility, for example. Bed **10** includes a panel **20** positioned near a head end **12** of the bed and a similar panel **22** positioned near the foot end **14** of the bed. In addition, a side rail **24** is positioned at the patient right **16** of the bed **10** and a second side rail **26** is positioned at the patient left **18** side of the bed **10**. Illustratively, a pendant **27** is coupled to siderail **26**. Pendant **27** is a user input device for an occupant of bed **10** or a caregiver to activate the various drives and functions of bed **10**. It should be understood that the reference to "head and" and "foot end" of the bed **10** are provided for clarity in understanding the various figures and do not refer to any particular point or structure unless otherwise noted. Generally, a person occupies a bed such as bed **10** in a supine position and reference to patient right **16** and patient left **18** provide a basis for understanding the various figures.

Patient-support platform **28** includes a head deck section **38**, a seat deck section **40**, and a foot deck section **42** which are each supported on a frame **44** (seen best in FIG. **5**). Deck sections **38**, **40** and **42** are each pivotable relative to frame **44** to vary the position of a patient-supported thereon. In the illustrative embodiment, bed **10** further includes a mattress **30** which is supported on the deck sections **38**, **40** and **42** and on which a patient is supported.

Foot end lift system **32** and head end lift system **34** each support frame **44** and are operable to raise and lower the respective ends of the patient-support platform **28**. Foot end lift system **32** includes a user input panel **46** which may be used by a caregiver to deactivate the various drives of the bed **10** to lockout movement of the seat deck section **40**, head deck section **38**, and/or the lift systems **32**, **34**. Head end lift system **34** is substantially similar to the foot end lift system **32**, however it should be noted that head end lift system **34** has the user input panel **46** omitted. The following discussion will describe the structure of the foot end lift system **32** and it should be understood that head end lift system **34** is a similar structure. While in the illustrative embodiment only lift system **32** includes user input panel **46**, it should be understood that the system **34** could also include a user input panel **46** in some embodiments. Similarly, it should be understood that user input panel **46** may be omitted from both of the lift systems **32** and **34** in some embodiments and the user input devices could be positioned elsewhere on patient-support apparatus **10**.

Referring now to FIG. **3**, lift system **32** includes a pair of supports **48**, **50**, a carriage **52** which is movable vertically relative to supports **48** and **50**, a winder **54** supported on carriage **52**, and a pair of tethers **56**, **58** which engage with the winder **54** and are coupled to the respective supports **48** and **50** such that the carriage **52** is suspended from the tethers **56** and **58**. As will be described in more detail below, as the winder rotates about an axis **60** tethers **56** and **58** are wrapped about a spool **62** which reduces the distance between the spool **62** in the top ends **64** and **66** of the supports **48** and **50** respectively. Winding of the tethers **56** and **58** about spool **62** causes the carriage **52** to travel vertically upwardly along the supports **48** and **50**.

Tether **56** is guided by a spool **68** which is rotatably mounted to a frame **72** of the carriage **52**. Spool **68** is positioned to maintain tether **56** in a vertical alignment along support **48** as a carriage **52** moves vertically along the supports **48** and **50**. Spool **68** engages with a channel **76** formed in support **48** and maintains engagement with the channel as carriage **52** moves vertically. As seen in FIG. **4**, the positioning of spool **68** is such that tether **56** tangentially contacts of the outer surface of spool **68** and is aligned with a surface **74** of channel **76**. The spool **68** and the channel **76** cooperate to maintain tether **56** in proper vertical alignment along support **48** as carriage **52** moves vertically. A second spool **70** guides tether **58** as carriage **52** moves along support **50**. Spool **70** is rotatably coupled to frame **72** of carriage **52** and is positioned such that tether **58** is maintained in proper vertical alignment. Support **50** also includes a channel **80** having a surface **78** similar to surface **74** of channel **76**. When spool **62** rotates in the direction of the arrow **82**, tethers **56** and **58** are wound upon spool **62** with the various layers of tethers **56** and **58** winding upon one another. As the tethers are wrapped, carriage **52** moves vertically in the direction of arrow **86**. As spool **62** is rotated in the direction of arrow **84** tethers **56** and **58** are unwound from spool **62** resulting in movement of carriage **52** in the direction of arrow **88**.

The carriage **52** further includes a pair of cover tubes **90** and **92** coupled to frame **72** of carriage **52**. Cover tubes **90** and **92** are sized to receive supports **48** and **50** respectively and to move vertically relative to supports **48** and **50** as the winder **54** winds tethers **56** and **58**. Spools **68** and **70** are positioned on frame **72** such that tethers **56** and **58** are enclosed within frame **72** or cover tubes **90** and **92** as carriage **52** moves vertically.

Tethers **56** and **58** are coupled to supports **48** and **50** in a manner in which the force of the load of patient-support platform **28** and carriage **52** utilizes the load to assist in securing the tether to the support. Referring now to FIG. **6**, the assembly of tether **58** to support **50** is illustrated. Support **50** includes a column **94** which is illustratively embodied as an aluminum extrusion, and a cap member **96** configured to be received on the column **94**. The topper **96** is formed to include a flange about a periphery of the topper **96** and a sized such that the flange extends beyond a top surface **98** of column-member **94** such that the flange of topper **96** engages a sidewall **100** of column-member **94**.

Tether **58** is formed to included an end **102** in which tether material is wrapped back upon itself. End **102** is received in a cavity **108** formed in cap member **96**. A pin **104** is received in a cavity **106** inboard of cavity **108**. Tether end **102** is secured in cavity **108** by a clamp member **110** which is secured to cap member **96** by a plurality of fasteners **112** and **114**. Clamp member **110** includes an upper portion **120** and a lower potion **122** that are interposed between the layers of end **102** as shown in FIG. **7**. Clamp member **110** secures end **102** of tether **58** into cavity **108** and is configured such that additional force in tether **58** increases the grip of clamp member **110**. Pin **104** floats in cavity **106**. The radius of the cylindrical surface of pin **104** transfers the generally vertical force acting on tether **58** without creating a stress riser in the tether **58** to reduce fatigue of tether **58**. Illustratively, tethers **56** and **58** are embodied as hardened **301** stainless steel strips. A cover **116** is secured to cap member **96** via fasteners **118** and protects the securing assembly for intrusion of liquids.

Spool **62** is driven by a prime mover **130** embodied as a drive assembly as seen in FIG. **3**. Prime mover **130** is secured to carriage **52** through a plurality of studs **194** onto which a plate **196** of prime mover **30** is fit and secured by a plurality of nuts **198**. Drive assembly **130** comprises a motor **132** with an output coupled to a speed reducer **134** and a limit assembly **136**. Motor **132** includes a transmission **138** which changes the direction of the output of motor **132** by 90 degrees. In the illustrative embodiment, the motor and transmission is a part number 0320AR available from Nidec Motors & Actuators of Ciudad Juarez, Chihuahua, Mexico. An output shaft **131** extends from speed reducer **134** to drive spool **62**.

An acme screw **140** coupled to transmission **138** is rotated as motor **132** runs. Limit assembly **136** includes a nut **142** and a **144** wiper coupled to the nut **142**. Nut **142** moves along screw **140** as motor **132** is driven to thereby move the wiper **144** between to limit sensors **146** and **148**. Contact with either one of the limit sensors **146** or **148** cuts power to motor **132** and thereby limits the travel of carriage **52** as shown in the electrical schematic of FIG. **11**. Wiper **144** moves along a channel **150** formed in a limit guide **152** coupled to motor **132**.

In addition to the motors **132** of each of the lift systems **32** and **34**, bed **10** includes additional drives, one to drive head section **38** and one to drive seat section **40**. The head section drive is a part number LA27-U038-00 and seat section drives is a part number LA27-U039-00 both of which are available from Linak U.S., Inc. of Louisville, Ky. A discussion of the articulation of the bed **10** is included in a related patent application titled FRAME FOR A PATIENT-SUPPORT APPARATUS, and having an application Ser. No. 11/960,303 which is incorporated in its entirety by reference herein. Various configurations of a controller **154** are used to control the operation of the bed **10** based on the power available to the system. Various configurations of controller are available from Linak U.S., Inc. of Louisville, Ky. For example, a part number CB6036 controller from Linak is configured for mains power of 120 VAC at 60 Hz. A part number CB6035 from Linak is configured for mains power of 230 VAC at 50 Hz. A CB6037 from Linak is configured for 100 VAC at 50 Hz. Each of these units convert power from mains to operate the DC drive system of the bed. In addition, each of the systems includes a battery charger to charge a standby battery which may be used when the bed **10** is disconnected from mains. The controller **154** is mounted to the carriage of lift system **34** and includes a power cord **156** which receives power from a standard wall outlet.

Lift **32** further includes a plurality of lock-out switches **160**, **162** and **164** which each lock out the head function, knee function, and hilow functions of the bed **10** respectively. The lock-out switches **160**, **162** and **164** are each toggle switches and are actuable between two positions. As shown in the schematic in FIG. **11**, the lock-out switches **160**, **162** and **164** operable to interrupt the connection between the pendant **27** the controller **156** to prevent operation of the various functions of bed **10**. Two batteries **166**, **166** are supported on the carriage **54** of lift system **32** and provide power to controller **156**. The batteries are a part number BPI1.2-12 available from B.B. Battery Co., LTD through B & B Battery USA, Inc. of Commerce, Calif.

Lift system **32** further includes two receptacles **168**, **168** secured to carriage **52** by a plurality of fasteners **170**. Receptacles **168**, **168** are configure to receive a portion of head end panel **20** to support the head end panel **20** on the carriage **52**. An outer cover **172** secured to carriage **52** with a plurality of fasteners **174** cooperates with an inner cover **176** to enclose a portion of carriage **52**. Cover **176** is secured to carriage with a plurality of fasteners **174**. A cover **178** is secured to carriage **52** to enclose the prime mover **130** and batteries **166**, **166**. An interface plate **180** couples to carriage **52** via a plurality of fasteners **182** and provides an interface point for connectors from cables coupled to the batteries and the lockout switches to communicate external to the lift system **32**. An aperture **184** serves to support a connector from prime mover **130** to permit communication of electrical power and signals external to the lift system **32**.

The lower ends of supports **48** and **50** engage with retainers **186** and **188** respectively such that tubes **90** and **92** are supported in relation to supports **48** and **50** respectively. Two casters **190** and **192** are each received in the bottom of supports **48** and **50** respectively to support lift system **32** and thereby bed **10** for movement across a floor. Frame **44** of platform **28** is secured to lift systems **32** and **34** by a plurality of bolts **200** and a plurality of nuts **202**. The effective length of bed **10** can be changed by altering the position of bolts **200** and nuts **202** relative to frame **72** of lifts **32** and **34**.

Having a "knock-down" type construction, bed **10** is suitable for use in a home as the various portions of bed **10** can be disassembled and assembled with the use of standard tools. Thus, frame **33**, lift systems **32** and **34** and deck sections **38**, **40** and **42** can be shipped separately and assembled on site. In general, articulating beds employing compound movement of deck sections relative to a frame are bulky and difficult to use in a non-institutional environment.

Although certain illustrative embodiments have been described in detail above, variations and modifications exist within the scope and spirit of this disclosure as described and as defined in the following claims.

The invention claimed is:

1. A patient-support apparatus comprising

a plurality of supports,

a first tether coupled to a first support,

a second tether coupled to a second support,

a patient-support platform, the patient-support platform includes a frame, a plurality of deck sections pivotable relative to the frame, a plurality of actuators each coupled to a deck section, the actuators configured to control a pivoting of the deck sections relative to the frame, and

winding means for winding and unwinding the tethers to vary the height of the patient-support platform relative to the supports such that as the tethers are wound the second tether is wound upon the first tether.

2. The patient-support apparatus of claim **1**, wherein the winding means is secured to the patient-support platform.

3. The patient-support apparatus of claim 2, wherein the winding means comprises a prime mover and a spool driven by the prime mover.

4. The patient-support apparatus of claim 3, wherein the prime mover comprises a motor including an output to drive the spool, the output driving a limit assembly configured to limit the operation of the motor when the patient-support platform reaches a vertical limit.

5. The patient-support apparatus of claim 4, wherein the prime mover further comprises a speed reducer interposed between the motor and the spool.

6. The patient-support apparatus of claim 1, wherein the winding means comprises a prime mover and a spool driven by the prime mover.

7. The patient-support apparatus of claim 6, wherein the prime mover comprises a motor including an output to drive the spool, the output driving a limit assembly configured to limit the operation of the motor when the patient-support platform reaches a vertical limit.

8. The patient-support apparatus of claim 7, wherein the tether comprises a stainless steel strap.

9. The patient-support apparatus of claim 1, wherein the tether comprises a stainless steel strap.

10. A lift system for a patient-support apparatus comprising

first and second tethers configured to be coupled to a first portion of the patient-support apparatus, and

a winder coupled to the tethers distal to the first portion, the winder configured to be coupled to a second portion of the patient-support apparatus and to rotate relative to the second portion of the patient-support apparatus to wind the first tether upon the second tether to vertically raise the second portion relative to the first portion and to unwind the first tether and the second tether to vertically lower the second portion relative to the first portion.

11. The lift system of claim 10, wherein the winder comprises a spool, a motor including an output to drive the spool, the output driving a limit assembly configured to limit the operation of the motor when the patient-support platform reaches a vertical limit.

12. The lift system of claim 11, wherein the winder further comprises a speed reducer interposed between the motor and the spool.

13. The lift system of claim 12, wherein the tethers are each a stainless steel strap.

14. A patient-support apparatus comprising

a patient-support platform, the patient-support platform includes a frame and a plurality of deck sections pivotable relative to the frame,

a plurality of columns configured to engage a floor,

a tether coupled to each column, and

a winder coupled to the patient-support platform and suspended by the tethers, the winder configured to gather the tethers such that the tethers overlie one another and release the tethers to thereby raise and lower the patient-support platform relative to the floor.

15. The patient-support apparatus of claim 14, wherein the winder is driven by a motor.

16. The patient-support apparatus of claim 14, wherein the winder comprises a spool, a motor including an output to drive the spool, the output driving a limit assembly configured to limit the operation of the motor when the patient-support platform reaches a vertical limit.

17. The patient-support apparatus of claim 16, wherein the tether comprises a first tether portion coupled to a first column and a second tether portion coupled to a second column and wherein each of the tether portions are contemporaneously gathered and released by the winder such that the patient-support platform raises and lowers along each of the first and second columns at generally the same speed.

18. The patient-support apparatus of claim 17, wherein the patient-support platform includes an outer tube coupled to the frame and configured to receive a column and a spool coupled to the outer tube, the spool configured to engage the tether and to rotate relative to the outer tube as the tether is gathered and released by the winder such that the spool guides the tether to the winder as the winder rotates.

19. A patient-support apparatus comprising

a first portion,

a first and second tethers coupled to a first portion of the patient-support apparatus,

a second portion of the patient-support apparatus movable relative to the first portion, and

a winder coupled to the each of the first and second tethers distal to the first portion, the winder supported on the second portion and rotatable relative to the second portion to wind the tethers such that the tethers overlie one another and unwind the first and second tethers to thereby move the second portion of the patient-support apparatus vertically relative to the first portion.

20. The patient-support apparatus of claim 19, wherein the winder is driven by a motor.

21. The patient-support apparatus of claim 20, wherein the tether engages a roller on the second portion, the roller configured to guide the tether as the winder gathers and releases the tether.

22. The patient-support apparatus of claim 21, wherein the tether comprises a stainless steel strap.

23. The patient-support apparatus of claim 22, wherein the winder comprises a spool and a motor driving the spool to rotate the spool about a horizontal axis, and a speed reducer interposed between the motor and the spool.

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